PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Gharpurey (TI-31261) Conf. No. 2970

Serial No. 09/785,759 Group Art Unit: 2618

Filed: February 16, 2001 Examiner: Yun

For: A Radio Architecture for Use with Frequency Division Duplexed Systems

REQUEST FOR RECONSIDERATION

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

Dear Sir:

This paper is presented in response to the Office Action mailed on July 18, 2007. It is submitted that this paper is fully responsive to that Office Action. Reconsideration of this application, for the reasons presented herein, is respectfully requested.

Claims 1, 4, 5, 7, 10, 11, and 13 through 15 remain in this case. No claim is amended.

Claims 1 and 8 were rejected under §103 as unpatentable over the Morishige et al. reference[1] in view of the Matero reference[2], and further in view of the Moore reference[3].

Regarding claim 1, the Examiner asserted that the Morishige et al. reference teaches all of the elements of the claim, except for mixers receiving a first local oscillator signal that has a frequency equal to the center frequency of the transmitter section or a sub-harmonic thereof, and

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[1] U.S. Patent No. 6,600,911 B1, issued July 29, 2003 to Morishige et al.

[2] U.S. Patent No. 6,215,988 B1, issued April 10, 2001 to Matero, on an application filed May 27, 1999, which is a continuation of an application filed May 15, 1997.

[3] U.S. Patent No. 4,766,392, issued August 13, 2988 to Moore.

except for the first and second high pass filters having inputs coupled to the outputs of the first and second mixers, respectively, and the downstream first and second sets of mixers. The Examiner asserted that the Matero reference teaches mixers that receive a local oscillator signal having a frequency equal to the transmit band center frequency or a sub-harmonic thereof,[4] and that the Moore reference teaches the first and second high pass filters and the first and second sets of two mixers coupled to the output of the high pass filters, respectively. The Examiner also asserted that it would have been obvious to the skilled artisan to provide the teachings of the Moore reference into the modified method of the Morishige et al. and Matero references, "to better reduce distortion during demodulation".

The claims dependent on claim 1 were also rejected under §103, on the grounds that their limitations were also taught by the same combination of references.

Applicant traverses the §103 rejection of claim 1 and its dependent claims 4, 5, 7, and 13, on the grounds that the rejection is in error as based on an erroneous combination of the prior art teachings, and on the grounds that the invention of claim 1 and its dependent claims is patentably distinct over the prior art of record.

First, Applicant maintains that the Examiner's interpretation of the Matero reference is in error, specifically because the cited portion of the Matero reference does not teach what the Examiner says that it teaches. The Examiner asserted that the Matero reference "teaches mixers receiving a local oscillator (LO) signal having a frequency equal to the transmit band center frequency or a sub-harmonic thereof".[5] The cited portion of the Matero reference reads:

> a modulator that modulates said local oscillator RF signal in accordance with information to be transmitted and that outputs a modulated RF signal, wherein when operating in said first frequency band said local oscillator RF signal has a frequency that is equal to said transmitted RF signal[6]

This passage of the reference makes no mention of a mixer or other circuit on the receiver side of its transceiver, much less teach the application of a local oscillator signal to such a mixer, at a frequency equal to the transmit band center frequency or a sub-harmonic. Rather, the modulator

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[4] Office Action of July 18, 2007, page 4, *citing* Matero, *supra,* at column 8, lines 17 through 22 (*i.e.,* its claim 1).
[5] Office Action, *supra,* page 3.
[6] Matero, *supra,* column 8, lines 17 through 22.

of the Matero reference is solely and completely on the transmit side of the disclosed transceiver, and has the stated function of producing the signal that is transmitted from that transmit side of the transceiver.[7] And therefore, it makes perfect sense that the local oscillator signal applied to the modulator is at a frequency related to the transmit frequency, because the modulator is in fact generating the signal to be transmitted.

Instead, according to the Matero reference, the transmit frequency has nothing to do with the local oscillator applied to mixers in its receive circuitry. The absence of teachings in this regard is made especially evident from various passages of the reference itself, regarding its synthesizer 46 that derives the local oscillator signal F_1:

> The synthesizer 46 operates in the 883-908 MHz band during receive and in the 890-915 MHz band during transmission.[8]
>
> This embodiment provides good isolation from the transmitter to the synthesizer 46, which operates in the 869.5 – 914 MHz band during receive and in the 855 – 892 MHz band during transmission (*i.e.,* one half of the DCS frequency band).[9]
>
> This embodiment also provides good isolation from the transmitter to the synthesizer 46, which operates in the 942.5 – 972.5 MHz band during reception and in the 925 – 955 MHz band during transmission.[10]

Based on these passages, it is apparent that the Matero reference is not concerned with the relationship between the transmit frequency and the local oscillator frequency during receive operation; indeed, the Matero reference repeatedly teaches that the frequency ranges of the synthesizer 46 can differ for receive operation from that used in transmit operation.[11] Therefore, Applicant submits that the Matero reference fails to disclose the applying of a local oscillator signal to a mixer in receive circuitry, where the local oscillator signal is at a frequency equal to the transmit band center frequency or a sub-harmonic.

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[7] Matero, *supra,* column 5, lines 31 through 34 ("The output of the modulator 44 is supplied to a first transmitter amplifier 62, to an (optional) 890 – 915 MHz transmit filter 64, and to a final power amplifier 66.").
[8] Matero, *supra,* column 5, lines 38 through 40.
[9] Matero, *supra,* column 6, lines 1 through 5.
[10] Matero, *supra,* column 7, lines 4 through 7.
[11] While the reference does mention that the transmit and frequency bands for synthesizer 46 can be the same in one situation (Matero, *supra,* column 6, lines 45 through 48), the reference still lacks any teaching that the local oscillator signal during receive is at the center frequency of the transmit band, leaving this wide 25 MHz frequency band over which the local oscillator frequency can range even for this situation.

For this reason, Applicant submits that the §103 rejection of claim 1 and its dependent claims is in error because it is based on an erroneous reading of the Matero reference.

Second, Applicant submits that the §103 rejection of claim 1 and its dependent claims is in error because the applied references cannot be operably combined in the manner asserted by the Examiner. As stated in the Office Action, the Examiner asserted that it would be obvious to insert the high-pass filters of the Moore reference into the receive path of the Morishige et al. and Matero references to better reduce distortion during demodulation. Applicant submits that there is no operable combination of these high pass filters into the Morishige et al. and Matero references, as asserted.

The Morishige et al. reference teaches an even harmonic quadrature receiver, in which the received signal is mixed with a local oscillator signal that is at one-half of the fundamental received signal frequency; the baseband signal resulting from this mixing is then filtered by a low-pass filter prior to demodulation.[12] The Matero reference discloses a heterodyne receiver architecture in which the received signal is downconverted in frequency once or twice, to produce an intermediate frequency (IF) signal for IF signal processing; this IF signal is then band-pass filtered,[13] as is fundamental in the heterodyne receiver art. Therefore, the Morishige et al. reference teaches a low-pass filter following its receive mixer, while the Matero reference teaches band-pass filtering following its receive mixers. In both cases, it is apparent that these filters are intended to keep the desired signal component (baseband and IF, respectively) while eliminating signal components outside of the desired band (interference, aliasing, and the like).

However, the Examiner asserts that one skilled in the art would be obviously motivated to include a high-pass filter in a modified system based on the Morishige et al. and Matero references, particularly in such a modified system in which the local oscillator frequency is selected according to the Matero reference. This substitution or combination, even if suggested, would defeat the purpose of the receiver of either the Morishige et al. or Matero receivers. Use

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[12] Morishige et al., *supra,* column 1, lines 24 through 42; column 7, lines 19 through 28.

[13] Matero, *supra,* column 1, lines 44 through 49; column 2, lines 27 through 44 ("The second filter of the signal conversion receiver has a center frequency in a range of approximately 45 MHz to approximately 60 MHz.); column 4, lines 53 through 57 (". . . since in both cases it is possible to achieve IF frequencies below 100 MHz."); column 5, lines 21 through 25 (". .. the 52 MHz IF filter 40, . . . ") and lines 50 through 54; column 6, lines 32 through 33.

of a high-pass filter in the Morishige et al. reference would both eliminate the baseband signal component and also pass aliasing and interference. Use of a high-pass filter in the Matero reference would ensure that aliasing from the mixers would remain in the signal to be processed by the IF signal processor (considering that the output frequencies from a mixer include signal components at the sum and difference values of the two frequencies, as known in the art). There is exactly no reason why one skilled in the art would include high-pass filters in the alleged receiver according to the modified Morishige et al. and Matero teachings.

For this reason, Applicant traverses the §103 rejection of claim 1 and its dependent claims, on the grounds that the Examiner has misinterpreted the teachings of the Matero reference, and also because the alleged combination of the teachings of the applied references is not suggested by the prior art because such a combination would defeat the purposes of the receivers disclosed by the references.

Applicant further submits that claim 1 is inventive over the properly combined and applied teachings of the prior art references. As discussed previously and repeatedly in the prosecution of this application, the invention of claim 1 provides the advantage of eliminating interference from the strongest interference source in an FDD system, by selecting the local oscillator frequency in the receive down-converter side to match the transmit frequency, converting transmit signal interference signal to DC, so that it is easily filtered from the resulting receive signal by a simple high-pass filter.[14]

In contrast, the Examiner asserts that the Matero reference teaches selection of its receiver local oscillator signal frequency to be the center frequency of its transmit band, or a sub-harmonic. As urged above, the Matero reference teaches no such thing. Furthermore, the Matero reference lacks any suggestion to apply a receive local oscillator frequency as claimed, as evident from the manner in which it selects its local oscillator frequency. As stated throughout the Matero reference, the local oscillator frequency F_1 is selected so that received signals in one frequency band (*e.g.,* GSM, DAMPS) can be converted to an intermediate frequency (IF) by a single downconversion, while received signals in another frequency band (*e.g.,* DCS1800,

[14] Specification of S.N. 09/785,759, page 3, lines 10 through 14.

DCS1900) can be converted to that same IF by a double downconversion, where the second downconversion uses the same mixer and filter as the single downconversion in the other frequency mode.[15] There is no mention or suggestion or hint in the Matero reference to select the local oscillator frequency to match the center frequency of the transmit frequency band or a sub-harmonic; rather, the Matero reference teaches selection of this frequency so that certain components (mixer, IF filter, IF signal processing circuitry, etc.) can be used for both modes of its dual-band receive circuitry, with the downstream circuitry operating at the same intermediate frequency (*e.g.,* 45 MHz or 52 MHz).

Accordingly, Applicant submits that the differences between the radio of claim 1 and the prior art, including that applied against the claims, provides important advantages that indicate the patentability of the claims over that art. And Applicant further submits that the skilled artisan would not obviously modify the combined teachings of the applied references, even using his or her ordinary creativity and common sense, in such a manner as to reach claim 1 and its dependent claims, because there is nothing in either the prior art or in one's ordinary creativity that would lead the skilled worker to make that modification.

For these reasons, Applicant submits that the rejection of claim 1 and its dependent claims is in error, and that claim 1 and its dependent claims are patentably distinct over the prior art applied thereagainst.

Claim 14 and its dependent claims 10, 11, and 15 were rejected, under §103, on similar grounds as claim 1 and its dependent claims, as discussed above. For the same reasons as discussed above, Applicant also traverses the rejection of claim 14 and its dependent claim, and submits that the method claimed in those claims is patentably distinct over the prior art of record. Specifically, Applicant traverses the §103 rejection of claim 14 and its dependent claims because the rejection is based on an erroneous combination of the prior art teachings, and because the invention of claim 14 and its dependent claims is patentably distinct over the prior art of record.

[15] Matero, *supra,* column 5, lines 50 through 58; column 6, lines 17 through 30, and lines 55 through 60; column 7, lines 36 through 50.

As discussed above relative to claim 1, Applicant submits that the Examiner's interpretation of the Matero reference is in error. First, while the Examiner asserted that the cited portion of the Matero reference teaches mixing with a local oscillator at a frequency equal to the transmit band center frequency or a sub-harmonic thereof,[16] that cited passage is not directed to the mixing or other functions on the receive side of its transceiver. That passage therefore does not teach mixing a receive signal with a local oscillator signal that is at a frequency equal to the transmit center frequency or a sub-harmonic, as claimed. Instead, the cited portion of the Matero reference discloses modulating a signal to be transmitted.[17] Therefore, the Matero reference does not disclose what the Examiner says it discloses. Numerous other locations of the Matero reference support Applicant's interpretation of the reference, by teaching that the synthesizer 46, which generates the local frequency $F_{1,}$ operates in different frequency bands during transmit than during receive.[18] Applicant therefore submits that the Matero reference fail to disclose the applying step of claim 14, contrary to the assertion of the Examiner. Applicant therefore submits that the §103 rejection of claim 14 and its dependent claims is in error.

Applicant also submits, relative to claim 14, that the applied references cannot be operably combined in the manner asserted by the Examiner in making the §103 rejection. As discussed above relative to claim 1, the Morishige et al. reference teaches low-pass filtering following its receive mixer, and the Matero reference teaches band-pass filtering following its receive mixer. Such filtering has the purpose, of course, of eliminating undesired signal components (due to aliasing or interference) from desired signal components. The Morishige et al. reference teaches low-pass filtering to preserve the baseband signal produced by its mixer, and the Matero reference teaches band-pass filtering to preserve its intermediate frequency (IF) signal for processing. High-pass filtering would not work in either situation, but would instead either eliminate the desired signal component or keep aliasing and interference. The skilled artisan simply would have no reason to make that combination, because that combination would degrade the receiver. Applicant submits that the skilled artisan would not be motivated to

[16] Office Action, *supra,* page 5.
[17] Matero, *supra,* column 5, lines 31 through 34 ("The output of the modulator 44 is supplied to a first transmitter amplifier 62, to an (optional) 890 – 915 MHz transmit filter 64, and to a final power amplifier 66.").
[18] Matero, *supra,* column 5, lines 38 through 40; column 6, lines 1 through 5; column 7, lines 4 through 7.

perform high-pass filtering of the down-converted receive signal after mixing in the Morishige et al. system as modified according to the Matero reference. Accordingly, the picking and choosing of the filter of one reference to combine with the mixing of other references, and the modifying the result that would then be required in such a manner as to reach claim 14, can only accomplished through the improper hindsight use of Applicant's own teachings.

For this reason, Applicant traverses the §103 rejection of claim 14 and its dependent claims. Reconsideration is requested.

Applicant further submits that the method of claim 14 is patentably distinct over the prior art of record in this case, especially considering the advantage it provides in eliminating interference from the strongest interference source in an FDD system, while enabling the use of low-cost components to do so.[19] As asserted above relative to claim 1, the Matero reference selects its local oscillator frequencies in order that its two possible frequency bands can share a common mixer and intermediate frequency filter, in producing an IF signal for processing that is at the same IF frequency for both frequency bands. There is no mention or hint of selecting the local oscillator frequency for the receive side with reference to the transmit frequency, much less so that transmit interference can be reduced to DC and easily filtered out, as results from the method of claim 14. Accordingly, Applicant submits that the important benefits provided by the method of claim 14 and its dependent claims stem directly from the differences between the claims and the properly combined prior art, and that these benefits indicate the substantial nature of these differences and thus the patentability of those claims.

For these reasons, Applicant submits that the §103 rejection of claim 14 and its dependent claims is in error, and that claim 1 and its dependent claims are patentably distinct over the prior art applied of record.

[19] Specification, *supra,* page 3, lines 10 through 14.

For these reasons, Applicant respectfully submits that all claims in this case are in condition for allowance. Reconsideration of this application is therefore respectfully requested.

Respectfully submitted,
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